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Mn-Catalyzed Oxidation of Heavy Oil in Porous Media: Kinetics and Some Aspects of the Mechanism

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Abstract

© 2016 American Chemical Society.Mn-catalyzed oxidation of the Ashalcha heavy oil in porous media was examined. We used manganese(III) tris(acetylacetonate) as a convinient oil-soluble precatalyst that decomposes to catalytically active species during the temperature ramping. Reaction kinetics in the heavy oil oxidation with air indicated that the presence of the manganese ions changes the mechanism of the oxidation process, especially in the high-temperature region. To study precatalyst transformations in detail, we suggested the approach of combining X-ray powder diffraction (XRPD), thermal analysis, non-isothermal kinetic methods, and electron paramagnetic resonance (EPR). A comprehensive study of the decomposition of pure manganese(III) tris(acetylacetonate) and the subsequent comparison of its behavior to that in porous media in the presence of the oil allows us to shed light on some aspects of the mechanism of catalytic oxidation.

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